**3GPP TSG-RAN WG3 Meeting #110-e *R3-207111***

**E-meeting, 2 – 12 November, 2020**

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| *CR-Form-v12.0* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **38.415** | **CR** | **0016** | **rev** | **1** | **Current version:** | **16.2.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network | **X** |

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|  | | | | | | | | | | |
| ***Title:*** | N3/N9 packet delay reporting for GTP-U path QoS monitoring | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Nokia, Nokia Shanghai Bell | | | | | | | | | |
| ***Source to TSG:*** | R3 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | TEI16 | | | | |  | ***Date:*** | | | 2020-11-06 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-16 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) Rel-12 (Release 12)* *Rel-13 (Release 13) Rel-14 (Release 14) Rel-15 (Release 15) Rel-16 (Release 16)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | TS 23.501 requests reporting of RAN packet delay by the RAN and accumulated N3 and N9 packet delay by the I-UPF, for GTP-U Path QoS monitoring. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | UL/DL RAN packet delay may be reported independently of the value of QMP Ind.  Added N3/N9 packet delay reporting over N9.  Impact assessment towards the previous version of the specification (same release):  This CR has an isolated impact towards the previous version of the specification (same release).  This CR only impacts QoS Monitoring. | | | | | | | | |
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| ***Consequences if not approved:*** | | Stage 3 not aligned on stage 2 requirements. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 5.4.2.1, 5.5.2.2, 5.5.3.13, 5.5.3.15, 5.5.3.a (new), 5.5.3.b (new) | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | | **Rev. 1:** Updated according to modified requirements: The N3 delay is not any more requested to be measured by the NG-RAN and reported over N3, but to be measured by the I-UPF and reported over N9 accumulated with N9 delay. | | | | | | | | |

#### 5.4.2.1 Successful operation

The purpose of the Transfer of UL PDU Session Information procedure is to send control information elements related to the PDU Session from NG-RAN to UPF.

An UL PDU Session user plane instance making use of the Transfer of UL PDU Session Information procedure is associated to a single PDU Session. The Transfer of UL PDU Session Information procedure may be invoked whenever packets for that particular PDU Session need to be transferred across the related interface instance.

The UL PDU SESSION INFORMATION frame includes a QoS Flow Identifier (QFI) field associated with the transferred packet.

If QoS monitoring has been requested for the included QFI field, the UL PDU SESSION INFORMATION frame may include a QoS Monitoring Packet (QMP) field, a DL sending time stamp repeated field, a DL receiving time stamp field, a UL sending time stamp field, and/or delay result for UL or DL. If QoS monitoring with N3/N9 delay reporting has been requested for the included QFI field, the I-UPF may include in the UL PDU SESSION INFORMATION frame a N3/N9 Delay Ind. field, a N3/N9 Delay Result field and delay result for UL and DL if received from the RAN. The UPF shall, if supported, use this information to calculate UL, DL, or RTT delay as specified in TS 23.501 [5].

The UL PDU SESSION INFORMATION frame may also include a UL QFI Sequence Number field associated with the transferred packet. The UPF shall, if the QoS flow has been configured eligible for redundant transport bearer in TS 38.413 [6], use the received UL QFI Sequence Number field to determine and eliminate duplicated packets for a given QoS flow as specified in TS 23.501 [5].



Figure 5.4.2.1-1: Successful Transfer of UL PDU Session Information

#### 5.5.2.2 UL PDU SESSION INFORMATION (PDU Type 1)

This frame format is defined to allow the UPF to receive some control information elements which are associated with the transfer of a packet over the interface.

The following shows the respective UL PDU SESSION INFORMATION frame.

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Bits | | | | | | | | | | Number of Octets |
| 7 | | 6 | 5 | 4 | 3 | | 2 | 1 | 0 |
| PDU Type (=1) | | | | | QMP | DL Delay Ind. | | UL Delay Ind. | SNP | 1 |
| N3/N9 Delay Ind. | Spare | | QoS Flow Identifier | | | | | | | 1 |
| DL Sending Time Stamp Repeated | | | | | | | | | | 0 or 8 |
| DL Received Time Stamp | | | | | | | | | | 0 or 8 |
| UL Sending Time Stamp | | | | | | | | | | 0 or 8 |
| DL Delay Result | | | | | | | | | | 0 or 4 |
| UL Delay Result | | | | | | | | | | 0 or 4 |
| UL QFI Sequence Number | | | | | | | | | | 0 or 3 |
| N3/N9 Delay Result | | | | | | | | | | 0 or 4 |
| Padding | | | | | | | | | | 0-3 |

Figure 5.5.2.2-1: UL PDU SESSION INFORMATION (PDU Type 1) Format

### 5.5.3 Coding of information elements in frames

#### <<< skipping unchanged clauses >>>

#### 5.5.3.8 QoS Monitoring Packet (QMP)

**Description:** This parameter indicates that the transferred packet is used for QoS monitoring as described in clause 5.4.1.1 and clause 5.4.2.1. This parameter also indicates the presence of the DL Sending Time Stamp in the DL PDU Session Information frame and the presence of the DL Sending Time Stamp Repeated, the DL Receiving Time Stamp, the UL Sending Time Stamp in the UL PDU Session Information frame. If QoS monitoring has not been configured for the involved QoS flow, the QMP shall be ignored by the NG-RAN node.

**Value range:** {0= not used for QoS monitoring, 1= used for QoS monitoring}.

**Field length:** 1 bit.

#### 5.5.3.9 DL Sending Time Stamp

**Description:** This field indicates the time when the UPF sends the DL PDU Session Information frame with the QMP field set to 1. It is used only in the downlink direction and encoded in the same format as the 64-bit timestamp format as defined in Section 6 of IETF RFC 5905 [6].

**Value range:** {0..264-1}.

**Field length:** 8 octets.

#### 5.5.3.10 DL Sending Time Stamp Repeated

**Description:** This field indicates the value of the DL Sending Time Stamp field that the NG-RAN has received in the DL PDU Session Information frame with the QMP field set to 1 for the involved QoS flow. It is used only in the uplink direction and encoded in the same format as the 64-bit timestamp format as defined in Section 6 of IETF RFC 5905 [6]. The UPF shall, if supported, use this information to calculate DL or RTT delay between the NG-RAN and the UPF as specified in [5].

**Value range:** {0..264-1}.

**Field length:** 8 octets.

#### 5.5.3.11 DL Received Time Stamp

**Description:** This field indicates the time when the NG-RAN node receives the DL PDU Session Information frame with the QMP field set to 1 for the involved QoS flow. It is used only in the uplink direction and encoded in the same format as the 64-bit timestamp format as defined in Section 6 of IETF RFC 5905 [6]. The UPF shall, if supported, use this information to calculate DL or RTT delay between the NG-RAN and the UPF as specified in [5].

**Value range:** {0..264-1}.

**Field length:** 8 octets.

#### 5.5.3.12 UL Sending Time Stamp

**Description:** This field indicates the time when the NG-RAN node sends this UL PDU Session Information frame. It is used only in the uplink direction and encoded in the same format as the 64-bit timestamp format as defined in Section 6 of IETF RFC 5905 [6]. The UPF shall, if supported, use this information to calculate UL or RTT delay between the NG-RAN and the UPF as specified in [5].

**Value range:** {0..264-1}.

**Field length:** 8 octets.

#### 5.5.3.13 DL Delay Ind.

**Description:** This parameter indicates the presence of DL Delay Result.

**Value range:** {0= DL Delay Result not present, 1= DL Delay Result present}.

**Field length:** 1 bit.

#### 5.5.3.14 DL Delay Result

**Description:** This field indicates the downlink delay measurement result which is the sum of the delay incurred in NG-RAN (including the delay at gNB-CU-UP, on F1-U and on gNB-DU) and the delay over Uu interface in milliseconds for the involved QoS flow. It is used only in the uplink direction and encoded as an Unsigned32 binary integer value. The UPF shall, if supported, use this information to calculate DL or RTT delay as specified in [5].

**Value range:** {0..232-1}.

**Field length:** 4 octets.

#### 5.5.3.15 UL Delay Ind.

**Description:** This parameter indicates the presence of UL Delay Result.

**Value range:** {0= UL Delay Result not present, 1= UL Delay Result present}.

**Field length:** 1 bit.

#### 5.5.3.16 UL Delay Result

**Description:** This field indicates the uplnk delay measurement result which is the sum of the delay incurred in NG-RAN (including the delay at gNB-CU-UP, on F1-U and on gNB-DU), the delay over Uu interface and the delay in the UE in milliseconds for the involved QoS flow. It is used only in the uplink direction and encoded as an Unsigned32 binary integer value. The UPF shall, if supported, use this information to calculate UL or RTT delay as specified in [5].

**Value range:** {0..232-1}.

**Field length:** 4 octets.

#### 5.5.3.17 Sequence Number Presence (SNP)

**Description:** This parameter indicates the presence of the DL QFI Sequence Number in the DL PDU Session Information frame or the presence of the UL QFI Sequence Number in the UL PDU Session Information frame.

**Value range:** {0= DL/UL QFI Sequence Number not present, 1= DL/UL QFI Sequence Number present}.

**Field length:** 1 bit.

#### 5.5.3.18 DL QFI Sequence Number

**Description:** This parameter indicates the sequence number as assigned by the UPF associated with a given QoS Flow.

**Value range:** {0..224-1}.

**Field length:** 3 octets.

#### 5.5.3.19 UL QFI Sequence Number

**Description:** This parameter indicates the sequence number as assigned by the NG-RAN node associated with a given QoS flow.

**Value range:** {0..224-1}.

**Field length:** 3 octets.

#### 5.5.3.a N3/N9 Delay Ind.

**Description:** This parameter indicates the presence of N3/N9 Delay Result.

**Value range:** {0= N3/N9 Delay Result not present, 1= N3/N9 Delay Result present}.

**Field length:** 1 bit.

#### 5.5.3.b N3/N9 Delay Result

**Description:** This field indicates the accumulated N3 and N9 packet delay as specified in [5], and is reported by the I-UPF. The reported value is expressed in milliseconds and encoded as an Unsigned32 binary integer value.

**Value range:** {0..232-1}.

**Field length:** 4 octets.